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Session 3 Discussion: The microstructure of eating

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Abstract
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Session 3 Discussion: The Microstructure of Eating
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Abstract

The Microstructure of Eating

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Q: I am surprised that no one mentioned the microbiome in the saliva and what an impact it might have on taste. The diversity of the microbiome of the saliva is just as diverse of the microbiome of the gut, but totally different. Could anyone educate [us] on the state of the field with respect to the composition of the oral microbiota and taste.

R[CR]: … at this point it is not known how that might drive differences in taste perception. If you think about the clefts present in the foliate and the circumvallate papillae, that would be the perfect microenvironment to harbor specific and different types of oral microbiota.

Q: The proposition is that the textural properties of food or the way it is masticated has a direct effect on an endocrine response or a response on satiety and satiation. My question is why doesn't chewing gum have an effect on satiety and satiation. Or does it?

R[JH]: I purposely didn't talk about chewing gum, because I was more interested in the food aspect of things. There was a meta-analysis on chewing gum released in the last year or two. Some people show that chewing gum can influence satiation and possibly satiety and others show it doesn't. My own personal perspective (and again this is just speculation) is that chewing gum is just viewed differently. It's not a food.

R[BJ]: The contribution of expectation can't be overstated. If you tell someone they will be full, they generally do report higher fullness. With chewing gum, they don't expect to.

R[CR]: I think this would be a good place to tie in what Steve Woods was saying earlier today about learning and conditioned responses, and how the learning process itself can change how we respond to a chewing gum versus a food that we learned has an energetic impact.

Q: Common experience would indicate texture is important to our perception of food and satisfaction. Trying to find an association between masticatory styles, bite strength, or any of these indices is maybe missing the point. Maybe chewing is only there to ensure that we have a safe bolus to swallow. Each of us has a different gag reflex and expectation of that [reflex]. The direct measure probably is that, the bolus, not the processing needed to get it there. We are measuring something that is not the primary driver.

R[JH]: I guess I would agree. … while we were interested in if there are differences in bit force and other parameters we could measure, there doesn't seem to be any convincing evidence that there are substantial enough differences that induce satiation on their own. I think the problem with a lot of these studies is they are highly confounded. We concurrently change masticatory style, eating rate as well as the palatability of the food. This is only my personal perspective. We're not looking at the mechanics of mastication on appetite anymore. We looked at this every single way we could. I think the interesting areas are the characteristics of the swallowed bolus and maybe people with impaired mastication such as older people or people with dental health problems.

Q: There is a new candy on the market funded by *Shark Tank*. On the outside it is chocolate, on the inside is very intense mint. It is supposed to stop a meal and mimic a dessert and a palate cleanser. Is there actually any data to support that?

R[BJ]: Quite cynically, our grant application was this idea of having a chocolate that enhanced satiation. The cynical part was we knew it would work irrespective of what we put in that chocolate, because you are stopping people from eating and getting them to concentrate on how full they feel. You can almost guarantee that candy will work, because people think it's going to work.

Q: What about the intense mint?

R[CR]: The idea that the intense mint cleanses the palate is probably a cultural phenomenon. People who are used to eating a mint after dinner, will say that the mint cleanses their palate.

Q: You mentioned with aging you are noticing mastication changes. Do you know if there are any related cultural or learned behaviors? Could a mother teach a child to chew more, or is it just random chance?

R[JH]: I'm not sure how mastication and chewing activity is learned. There are a lot of physiological aspects: the way your teeth are orientated, the occlusal, the surface area. Whether at a young age you could teach your children to chew slower or eat slower, that I'm afraid, I don't know.

R[BJ]: Melissa Jeltema has proposed a set of chewing styles where people can be classified into groups such as a cruncher, sucker or smoosher [The Understanding & Insight Group]. She is adamant that one's mouth behavior is set very early. However, she's based that on her own grandchildren and argues there is very little your parents can do about it.

R[FT]: Studies have been done on Okinawa, and very early in life, the parents feed their children very slowly. That does two things. One thing it does is the child gets full faster. Then later in life, they don't eat as much. Okinawa has the longest-lived people in Japan, and Japan has the longest-lived people in the industrial world. It's my understanding there are good data to indicate that you can modify that behavior very early in life.

R[BJ]: The cultural aspects of chewing and mastication are absolutely huge. One of my colleagues at Plant and Food Research in New Zealand, Morgan Stern, is looking at cultural chewing behaviors. He suggests that most of chewing behavior is learned though there's a combination of culture, biology, and availability of foods as well.

R[JH]: There are a number of epidemiological studies showing a direct negative association between eating rate and body weight. The point I want to make is that change in mastication is not the only thing that can influence eating rate, it's not the only thing that can be changed. We could get people to put their forks down. People have been trained to eat with chop sticks instead of more culturally familiar utensils to try to slow them down. There are many ways to

change eating rate without changing the mechanics of chewing and mastication. They may be successful, and it may also be a problem. In elementary schools, children must eat very quickly because they have a very short period of time to eat their meal. Perhaps this is teaching them a bad habit.

Q: My question concerns food complexity. It all makes sense until you start to think of something like a soda. It's viscous, it has carbonation, there's lots of tastes and aromas. However, liquids are less satiating than solid food. Is it due to the lack of mastication or is it an anomaly related to complexity?

R[BJ]: If you compared soda to water, you would see the increasing complexing exerts an effect. But just the idea of complexity is complex. We have a confection in New Zealand called a milk biscuit that is simply compressed milk powder. They are the simplest food one can imagine. If you ask people if this confection is texturally complex, they would say, "No, it's just milk powder." But when you put that in your mouth at first you have a fracture behavior, then it absorbs saliva and becomes, sticky and glumpy. It is actually texturally very complex. The idea of simplicity to complexity on a spectrum of texture is intractable and we're a long way off from being able to ask that yet.

Q: I know that in some cultures, it is traditional to chew with the mouth closed and in other cultures there is a lot of smacking behavior that presumably introduces air into the oral cavity. How do these cultural differences in open versus closed mouth eating effect perception and textures and the downstream metabolic effects?

R[BJ]: I don't think we are very close to an answer yet. The difficulty is data gathering. You really need a huge dataset for this. If you put people into an articular graph with magnets on their teeth it is very invasive, but you get beautiful data. What my colleagues in New Zealand have done is a lot of video capturing using web cams. They put dots on peoples' chins and they use translation software to pick up movements. It's a pretty close approximation. They gave potato chips to teenage consumers in New Zealand, Korea, and China. The Kiwi kids went crunch, crunch, crunch with crumbs everywhere. The Korean kids [had] very small movement of the chin, very discrete mouth movements. Of course, the Kiwis knew what to expect with those potato chips; they were Kiwi potato chips. The Korean kids would have never seen them before. Again, there are the cultural aspects and there are expectation aspects.